The Effects of Alcohol-Intoxication on Emotion Perception and Online Awareness

Holly Emery

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Statement of Sources

I declare that this report is my own original work and that contributions of others have been duly acknowledged.

Holly Emery Date

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Table of Contents

List of Tables

List of Figures

List of Acronyms

ACS-AF	Advanced Clinical Solutions - Affect Naming
ANDI	Adjusted Normalised Discrimination Index
AUDIT	Alcohol Use Disorders Identification Test
AMM	Alcohol Myopia Model
BAES	Biphasic Alcohol Effects Scale
BMI	Body Mass Index
BrAC	Breath Alcohol Concentration
BRS	Beverage Rating Scale
CAVEAT	Complex Audio Visual Emotion Assessment Task
FIML	Full Information Maximum Likelihood
K10	Kessler Psychological Distress Scale
MLM	Mixed Linear Model
OFC	Orbitofrontal Cortex
O/U	Overconfidence/Underconfidence
SEQ	Social Emotional Questionnaire
TBI	Traumatic Brain Injury
TLFB	Timeline Follow-Back
ToM	Theory of Mind

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Holly Emery

Abstract

Alcohol-intoxication is implicated in negative social behaviours, however the mechanisms underlying this relationship are poorly understood. Impaired emotion perception following alcohol consumption may partially account for this link, however limited methodology in prior studies undermines the efficacy of this explanation. The current study investigated the effect of acute high-dose alcohol-intoxication on emotion perception, across a broad array of primary and secondary emotion types (*positive*: amused, caring, confident, enjoyment, excited, flirtatious, happy, interested, positively surprised, proud, relieved; *negative*: angry, annoyed, baffled/unsure, contempt, disinterested/bored, disgusted, fearful/anxious, negatively surprised, sad, shy, and suspicious) depicted in contextualised video vignettes. Self-appraisals of performance accuracy were also investigated. Sixty-eight participants consumed either a placebo or beverage containing alcohol. The Complex Audio Visual Emotion Assessment Task (CAVEAT) assessed emotion perception ability. Anticipatory performance accuracy and emergent confidence judgements were made on the CAVEAT. Emotion perception ability and emergent confidence judgements did not differ across conditions. However, alcohol-intoxicated individuals' anticipatory performance accuracy was more aligned to their actual performance than individuals who received a placebo beverage. Overall, these results suggest that (1) the addition of contextual information may compensate for any pending deficits in perception of facial emotional expressions; and (2) the questioning of performance accuracy may prompt intoxicated individuals to become more aware of their impending deficits, which may lead to better monitoring of task performance and improved performance. Implications for current theory and government policy are discussed.

Alcohol has the highest consumption rate of any drug in Australia (Australian Institute of Health and Welfare, 2017). Its association with increased confidence and self-perceived improvements in communication, labels alcohol a valuable social lubricant for an array of social events (Monahan & Lannutti, 2000). Conversely, acute alcohol-intoxication is implicated in a variety of negative behavioural and cognitive outcomes, notably, increased aggression and impulsivity, and impaired decision-making (Heinz, Beck, Meyer-Lindenberg, Sterzer, & Heinz, 2011). While alcohol's link to these aversive behaviours is well established, the mechanisms underlying the relationship are poorly understood (Attwood & Munafò, 2014). However, without such knowledge, the development of government policies and interventions to target and ultimately eliminate such negative behaviour is not possible.

Alcohol-induced impulsivity amplifies the occurrence of alcohol-related violence (Graham, West, & Wells, 2000). Indeed, such a causal link is reflected in assault being one of the most commonly cited alcohol-fuelled crimes, with 45% of Australians surveyed reporting either being, or knowing someone who is, a victim of alcohol-related violence (FARE, 2018). Such behaviour is likely a result of the increased use of offensive statements with the intention to provoke retaliation when under the influence of alcohol (Reisig & Pratt, 2011). The alarming increase in alcohol-related violence is further illustrated by the rise of alcohol-fuelled one-punch assaults in Australia, with 28 fatalities recorded between 2013 and 2016 (Schumann, 2019), compared to 49 between 2000 and 2012 (Pilgrim, Gerostamouslos, & Drummer, 2014). Such negative outcomes are not isolated to social drinking, with domestic violence another commonly cited negative outcome of acute alcohol-intoxication (Laslett et al., 2015; Lee & Forsythe, 2011).

One suggested explanation for how acute alcohol-intoxication contributes to poor social responding is impairment in social communication and the associated cognitive processing of social information (Quaglino, Wever, & Maurage, 2015). Communication is central to effective social functioning (Attwood & Munafò, 2014). However, communication is not solely verbal, it also has behavioural and contextual elements that are used to convey social messages (Burgoon et al., 2002). Acute alcohol-intoxication is demonstrated to diminish the interpretation of such communication mediums, consequently undermining social functioning (Attwood & Munafò, 2014). As such, it may be that alcohol impairs the ability to appraise and respond to social information, thus damaging the prosperity of social interaction.

Alcohol Myopia Model

The leading theory for explaining alcohol-induced behaviours, the Alcohol Myopia Model (AMM) proposes that alcohol impairs social functioning by restricting cognitive resources, leading to a state of myopia, where only the most salient stimuli are attended to, and limited internal and external cues are used to evaluate situations (Giancola, Duke, & Rita, 2011; Steele & Josephs, 1990). A consequence of such myopia effects are reductions in the ability to engage with complex, deliberate, cognitive processes that are reliant on attentional focus and essential for successful social interactions (Giancola, Josephs, Parrott, & Duke, 2010).

Social communication is a complex and dynamic ability, requiring the evaluation of several inter-personal and environmental cues to facilitate effective social responding (Halberstadt, Denham, & Dunsmore, 2001). Such abilities are thought to be impaired following alcohol-intoxication (Steele & Josephs, 1990), believed to stem from the reduction in overall perceptual monitoring (Giancola et al.,

2010). The AMM proposes that it is the neglection of less salient (often inhibitory) cues, and overreliance on more salient stimuli that contributes to the misinterpretation of social events and consequent inappropriate social responding (Giancola et al., 2011). For instance, when immersed in social conflict (i.e., an argument) those under the influence of alcohol are more attentive to salient stimuli (i.e., an insult) than more subtle inhibitory cues (i.e., contemplation of consequences to violence outbursts).

Social Cognition

Social cognition reflects the ability to acknowledge, comprehend and negotiate interpersonal cues, thus facilitating effective social functioning (McDonald, Honan, Kelly, Byom, & Rushby, 2013). Social cognition may also be differentiated according to 'lower-order' and 'higher-order' social cognitive processes (Ladegaard, Larsen, Videbech, & Lysaker, 2014a). 'Lower-order' processes are considered implicit functions, (i.e., occur without conscious effort) and include basic perceptual processes such as emotion perception ability (Ladegaard, Lysaker, Larsen, & Videbech, 2014b). These 'lower-order' abilities are essential for 'higher-order' social cognitive processing, notably the abilitiy to negotiate moral dilemmas (moral reasoning) and the capacity to attribute mental states to another or theory of mind (ToM) (Ladegaard et al., 2014b).

Emotion perception is paramount for successful participation in social situations, as it provides information regarding the intention and receptiveness of others (Attwood et al., 2009). When impaired, this can transgress appropriate social responding and behavioural regulation, as the individual is unable to recognise how others are responding to their actions (Attwood & Munafò, 2014). For instance, when speaking to someone about weekend related events, detection of anger may prompt

conversation change or discontinuation. However, if someone was unable to perceive anger emotion displays, they may pursue the same conversation topic counter to the receptiveness of others.

Acute alcohol-intoxication impairs these 'lower-order' and 'higher-order' abilities (Mitchell, Beck, Boyal, & Edwards, 2011; Quaglino et al., 2015). As emotion perception provides not only information pertaining to the social receptiveness of another, but also essential foundations for 'high-order' social cognitive processes, understanding *how* acute alcohol-intoxication interacts with emotion perception will provide valuable insight into the potential mechanisms underlying alcohol's relationship with poor social functioning.

Alcohol's Acute Effects on Emotion Perception Ability

Compromised emotion perception ability has been suggested as one factor that may account for the deficits in social functioning following acute alcohol-intoxication (Attwood & Munafò, 2014). Specifically, the inability to recognise the responsiveness of others may lead to the pursuance of unreceptive social interaction (Attwood et al., 2009). While a sound rationale for explaining alcohol's contribution to poor social functioning, the empirical support for the role of emotion perception is limited and lacking consistency.

A recent study by Honan, Skromanis, Johnson, and Palmer (2017) used an emotion recognition task that displayed morphed images to depict facial emotional expressions at varying intensities. The forced-choice task required participants to indicate which emotion (fear, sad, happy, disgust, surprise, anger) corresponded to that displayed in the image. The results indicated that participants with an average Breadth Alcohol Concentration (BrAC) level of .078 showed impairments in the identification of fear and sadness, displayed at moderate-to-high intensities (60%,

80% and 100% intensity), compared to a placebo condition. Conversely, Kamboj et al. (2013) found that alcohol at moderate intoxication levels (0.4g/kg) was associated with the mislabelling of neutral emotional expressions as sadness. However, this study used a threshold detection paradigm, which required participants to view an initially neutral facial expression which then morphed into an emotion expression. Participants indicated at what point in the transition they detected an emotional expression and then judged what this emotion was. The same effect was not seen in either the high-dose (0.8g/kg) or placebo condition. Other studies, using the same methodology as Kamboj et al. (2013), have found that at moderate intoxication levels (0.4g/kg) alcohol-intoxicated participants required a significantly higher level of perceptual stimuli for sadness to be identified (Attwood et al., 2009; Craig et al., 2009), suggesting that a moderate alcohol dose is sufficient to elicit detectable impairments in emotion perception using a detection threshold paradigm.

Other researchers have failed to find any impairments in emotion perception following alcohol-intoxication. Walter et al. (2011) used a similar detection threshold paradigm as Kamboj et al. (2013) and found that those who consumed a moderate dose of alcohol (0.4g/kg) showed no impairment in emotion perception ability compared to a placebo condition. However, Walter et al. (2011) did find that participants who believed they received an alcoholic beverage labelled emotional expressions as happy more readily than those with no expectation about the beverage they consumed. These findings suggest that emotion perception may not be impaired following alcohol-intoxication at moderate levels, but rather this dose may act as a social lubricant, where individuals anticipate alcohol to improve their social skills and thus are more expecting of positive social feedback. Findings from Kano et al. (2003) supported this assumption, finding that alcohol at low-doses (0.14g/kg) led to

enhanced detection of happiness in static facial images. However, at moderate-to-high-doses (0.56g/kg) this effect was reversed. The researchers maintained that this pattern of results suggests that at low-doses alcohol acts as a stimulant, whereas at high-doses it has a sedative effect (Kano et al., 2003).

The above findings from prior research indicate that acute alcohol-intoxication does interfere with emotion perception ability, but to what extent is undetermined. However, it is important to note two major methodological limitations of this prior research. The first concerns the restricted range of emotion types assessed. The second concerns the use of laboratory-based tasks with low ecological validity.

Traditional emotion perception tasks use, at most, the six basic and universal emotions of happiness, sadness, disgust, anger, surprise, and fear. However, human emotional expressions are more dynamic and varied than those usually discussed in the literature (Scherer, 2005). Emotional expressions also routinely fall within one of two valence categories; positive or negative. However, emotion perception assessment tasks do not proportionally reflect this divide. Specifically, happiness is the only definitive positive emotion currently used in emotion perception tasks. This is an important limitation since happiness trials commonly experience ceiling effects, which is attributable to its ease of detection without the inherent need to decode the salient 'trademark' facial features further (Rosenberg et al., 2019). Surprise was initially indicated to be a second positive emotion type; however, its valence is now often disputed (Noordewler & Breugelmans, 2013). The open mouth, a feature of surprise expressions, is also often mistaken for fear (Honan et al., 2016, 2017). It is therefore unclear which valence category surprise belongs to. Overall, the limited

range of emotion expressions used in traditional assessments do not reflect the variation of emotional expressions encountered in social interactions.

A further limitation of prior studies is the use of tasks that comprise of morphed and static images of facial emotion expressions. These tasks do not portray emotional expressions as they are usually experienced in an enriched social context (Rosenberg et al., 2019). Importantly, given context can alter emotion perception (Aviezer et al., 2008; Barret, Mesquita, & Gendron, 2011), alcohol-induced deficits observed in traditional emotion perception tasks may not reflect how these impairments would transpire in real-world social settings.

Neuroanatomical Evidence

The capacity to efficiently perceive, decode, and recognise various social cues is facilitated by the complex neurological system referred to as the 'social brain' (Adolphs, 2009). The evolutionary need to negotiate complex social stimuli is believed to account for this well refined neurological system (Adolphs, 2001). Emotion perception's relevance to effective social communication is represented well within this structure (Adolphs, 2009).

The rostral anterior cingulate cortex, amygdala, ventral and medial prefrontal cortex, insula, and orbitofrontal cortex (OFC) form the social brain and are all implicated in emotion perception ability (Hamann, 2012). Indeed, research has demonstrated that disruption to these regions induces impairments in perception of one or more emotion types (Adolphs, Tranel, Damasio, & Damasio, 1995; Phillips et al., 1997; Wicker et al., 2003). One of these primary regions, the amygdala, has consistently demonstrated a fundamental role in perception across emotion types (Adolphs, 2009; Adolphs, 2010; Vuilleumier & Pourtois, 2007).

Importantly, research has demonstrated that the social brain is compromised following alcohol-intoxication (Gorka, Fitzgerald, King, & Phan, 2013; Magrys & Olmstead, 2014). Thus alcohol-induced impairments in emotion perception may be expected. Indeed, research has illustrated that both disruption to the isolated regions of the social brain and the connections between them explains alcohol's contribution to impaired emotion perception. Specifically, Gorka et al. (2013) identified that variable dysfunctional connections between the amygdala and the OFC following acute alcohol-intoxication was related to impaired processing of fearful, angry and happy facial stimuli. These results suggest that alcohol may impair emotion perception by altering the functional connectivity of the social brain, which in turn may reduce the overall efficacy of detection of salient social information, i.e., threat, and thus undermine responding in social situations (Gorka et al., 2013).

Metacognitive Awareness

Alcohol's contribution to poor social functioning has also been suggested to stem from its link with reduced metacognitive awareness; the capacity to anticipate and monitor errors in thinking and performance (Toneatto, 1999). Metacognitive awareness facilitates the appraisal of oneself within a given context (Flavell, 1979), with impairment often translating to inappropriate or misguided actions (Frith, 2012).

Toglia and Kirk (2000) developed a multidimensional framework of metacognitive awareness to conceptualise 'in-the-moment' performance awareness. Referred to as online awareness, this self-reflective ability encompasses two components; anticipatory and emergent awareness. Activated at the commencement of a task, anticipatory awareness describes the ability to predict future errors in performance based on one's current perceived performance capacity. Emergent awareness is the ongoing ability to recognise errors as they occur and correct

responding accordingly. Errors in anticipatory awareness can cause an over exaggeration of actual performance ability, which can result in dangerous behavioural choices (Quillian, Cox, Kovatchev, & Phillips, 1999). Whereas emergent awareness impairments translate to poor monitoring of self-performance. Specifically, when the capacity to recognise errors is distorted, often ill-informed responses are persuaded counter to the requirements of the task at hand (Ridderinkhof et al., 2002). For instance, when conversing socially regarding a topic that is not well understood, someone with good online awareness would be able to consider the likelihood of errors in their judgement and exercise appropriate caution in their responses. However, someone with poor online awareness may not be able to recognise errors in their judgements and consequently exhibit inappropriate overconfidence in their responding.

Metacognitive awareness has shown to be considerably impaired following alcohol-intoxication, believed to stem from a reduced capacity to attend to self-relevant information from the environment, such as evaluation feedback and self-reflection processes (Hull, 1981). Indeed, Ridderinkhof et al. (2002) illustrated that alcohol-intoxication impaired participants' ability to self-correct following errors. This suggests that alcohol's effect on cognitive performance tasks may stem, at least partly, from a reduced capacity to monitor errors in performance (i.e., emergent awareness), and alter responding to compensate for these in future (i.e., anticipatory awareness) (Bartholow, Henry, Lust, Sault, & Wood, 2012). To observe how metacognitive judgements of emotion perception ability are affected in acute alcohol-intoxication, Honan et al. (2017) asked participants to make metacognitive judgements of performance following the completion of each item in an emotion perception task. Results showed less insight of actual performance demonstrated in

acute alcohol-intoxicated participants compared to a placebo condition. Thus, supporting the link between acute alcohol-intoxication and reduced metacognitive awareness of emotion perception ability.

Aim and Hypothesis

Accurate emotion perception is paramount for successful negotiation and appraisal of social situations (Attwood et al., 2009). As such, deficits in this ability have been suggested to account for the diminished social functioning associated with alcohol-intoxication (Quaglino et al., 2015). While alcohol's role in poor social functioning is well established, *how* emotion perception ability contributes to this is poorly defined (Attwood & Munafò, 2014). In consideration of the abovementioned methodological limitations the current study aims to refine current understanding of high-dose alcohol-induced impairments in emotion perception by using a more ecologically valid task that assesses emotion perception ability across twenty-two emotion types of balanced positive and negative valence. High-dose alcohol-intoxication is being investigated, as cognitive impairments are more pronounced at this level (Dry et al., 2012). An understanding of how metacognitive awareness of social cognitive processes in alcohol-intoxicated individuals is also limited (Honan et al., 2017). Such knowledge is important since an awareness of deficits and error correction is essential to the provision of effective social responding (Frith, 2012). Thus, the current study will supplement emotion perception ability with assessments of online awareness to systematically outline how alcohol interacts with participants' performance insight. It is hypothesised that:

H1: Consistent with the prior findings of Honan et al. (2017), alcohol-intoxicated individuals will perform more poorly in the accurate detection of the basic universal emotions of fear and sadness relative to individuals given a placebo, albeit, using the

ecologically valid task. Accurate detection of all secondary emotion types, due to their less salient status (Giancola et al., 2011), on this same task will be poorer in the alcohol-intoxicated individuals compared to individuals given a placebo.

H2: Alcohol-intoxicated individuals will exhibit poorer anticipatory and emergent awareness of emotion perception task performance relative to individuals given a placebo. This is based on prior findings that acute alcohol-intoxication impairs efficacy of metacognitive appraisals of performance (Bartholow et al., 2012; Honan et al., 2017; Hull, 1981).

Method

Design

This study implemented a placebo-controlled, quasi-randomly allocated (equal ratio of gender across groups), between-subjects, single-blind, design. There was one between-subjects independent variable Condition (alcohol, placebo), and two within-subjects independent variables Emotion Valence (positive, negative) and Emotion Type (*positive*: amused, caring, confident, enjoyment, excited, flirtatious, happy, interested, positively surprised, proud, relieved; *negative*: angry, annoyed, baffled/unsure, contempt, disinterested/bored, disgusted, fearful/anxious, negatively surprised, sad, shy, and suspicious). For Hypothesis 1 the dependent variable was correct indication of emotion type. For Hypothesis 2 the dependent variable was metacognitive judgement responses.

Participants

The total sample consisted of 68 participants aged between 18 and 35 years. Participants were quasi-randomly allocated to either a placebo or alcohol condition (balanced for gender). A series of independent samples *t*-tests indicated no significant group differences in age or level of education (see Table 1 for descriptive

and inferential statistics). A Chi-square test of independence showed no significant differences between proportion of females (52.9%) and males (47.1%) in the alcohol condition compared to females (47.1%) and males (52.9%) in the placebo condition, χ^2 (1, N = 68) = 0.24, p = .628, Cramer's V = .06.

An a priori power analysis using G*power 3.1.9.4 (Faul et al., 2007) was conducted prior to participant recruitment. Based on an expected effect size of d = .80 (Honan et al., 2017) (power = .80, alpha level = .05), 35 participants per group (70 in total) were required to detect statistically significant results.

Table 1

Descriptive and Inferential Statistics for Demographic Information

	Alcohol	Placebo				
	M (SD)	*M (SD)*	*t*	*df*	*p*	Cohen's *d*
Age	23.00 (4.49)	24.53 (4.98)	1.33	66	.188	.32
Education[#]	12.68 (1.12)	13.03 (1.49)	1.08	63.16	.285	.27

Note: [#] Equal variances not assumed statistic reported.

Recruitment occurred via advertisement on the University of Tasmania's Psychology website (SONA) (Appendix A), verbal presentation in lectures, and placement of notices (Appendix B) in the wider community. Participants received a Village Cinemas movie voucher to compensate for their time. Alternatively, psychology students were rewarded three hours of research participation course credit.

To assess eligibility, those wishing to participate were directed to an online screening survey. Participants were required to have fluent ability to speak and read

English, completed Year 10 or equivalent, consumed at least two standard drinks on one occasion in the previous month, normal, or corrected-to-normal, vision, and a Body Mass Index (BMI) between 18.50 and 29.90. Exclusion criteria included: regular tobacco smoker (daily use of one or more cigarettes), use of illicit drugs within the preceding six months, use of prescription medication (exception of contraceptive medication), participation in a drug trial within the preceding three months, history of any significant neurological condition, current diagnosis of a significant physical or psychological condition, current psychological distress (score of 30 or higher on the Kessler Psychological Distress Scale (*K10;* Kessler et al., 2002)), and a history of drug or alcohol abuse or dependence (evidenced by a score of 16 or higher on the Alcohol Use Disorders Identification Test (*AUDIT*; Babor et al., 2001)). One-hundred and twelve individuals completed the online survey, however forty-four did not satisfy inclusion criteria and thus were excluded.

Materials

Screening Measures

Alcohol Use Disorders Identification Task (*AUDIT*; Babor et al., 2001). The AUDIT assesses drinking behaviour to identify individuals that have harmful or hazardous patterns of alcohol consumption. Ten questions are used to assess recent patterns of alcohol consumption, degree of alcohol dependence symptoms, and problems associated with alcohol consumption. Responses are either reported on a Likert-scale (based on frequency of occurrence) or by indication of standard drinks. Scores range from 0-40, with scores greater than eight indicating harmful/hazardous use. Eligibility criteria excluded respondents with scores 16 or above, as some experience with alcohol was required for the study. The AUDIT has demonstrated

good internal consistency (α = .81) (Shields & Caruso, 2003) and excellent classification validity (Reinert & Allen, 2007).

Kessler Psychological Distress Scale (*K10;* Kessler et al., 2002). The K10 assesses the level of psychological distress experienced in the preceding thirty-days. It comprises 10 questions which pertain to the extent of distress symptoms experienced. Respondents are required to indicate the prevalence of symptom occurrence on a 5-point Likert-type scale (1 = 'None of the time' – 5 = 'All of the time'), with total scores ranging from 10-50. Scores of 30 or above indicate high psychological distress, and thus those respondents were excluded. The K10 has demonstrated excellent internal consistency (Cronbach's α = .93; Kessler et al., 2003), and adequate sensitivity and specificity (.80 and .81 respectively) (Donker et al., 2010).

Timeline Follow-Back *(TLFB;* Sobell & Sobell, 1992). The TLFB is a self-report assessment used to assess drinking patterns over the preceding 2 months. It requires respondents to indicate, by writing on a calendar, how many standard drinks they consumed each day. Clear indications for what constitutes a standard drink is provided through the use of diagrammatical illustrations. The TLFB was used to ensure the consumption of at least two standard drinks on one occasion in the previous month (to ensure previous exposure to alcohol), and no consumption of alcohol within 24 hours of testing. The use of retrospective self-report measures of alcohol consumption has shown consistent reliability and validity in the literature (Del Boca & Darkes, 2003).

Manipulation Check Measures

Biphasic Alcohol Effects Scale *(BAES;* Martin et al., 1993). The BAES is a self-report measure of the degree of experiencing stimulant and sedentary effects

associated with alcohol-intoxication. It requires respondents to indicate on an 11-point Likert-type scale how much they are currently experiencing various symptoms (1 = 'Not at all' – 11 = 'Extremely'). Seven stimulant (i.e. 'elated') and seven sedentary (i.e. 'inactive') items are included with total possible scores ranging from 14 to 154. The BAES is commonly used to monitor the subjective experience of alcohol across ascending and descending BrAC levels (Rueger & King, 2013). Factor analysis has supported the two-factor structure of the BAES, with strong internal consistency estimates for both sedentary (Cronbach's α = .73-.97) and stimulant (Cronbach's α = .86-.92) subcomponents (Earleywine & Erblich, 1996).

Beverage Rating Scale *(BRS;* Fillmore & Vogel-Sprott, 2000). The BRS is used to assess self-perceived levels of intoxication. Respondents are required to indicate the alcohol content of the beverage they consumed during testing. To do this, participants indicate the equivalent number of bottles of beer (containing 4.8% alcohol) that they believed they consumed. The BRS has demonstrated experimental efficacy, as evidenced by its use as a manipulation check in similar studies (Honan et al., 2017; Peacock, Bruno, Martin, & Carr, 2013).

Baseline Measures

Social Emotional Questionnaire (*SEQ*; Bramham, Morris, Hornak, Bullock, & Polkey, 2009). The SEQ is a self-report measure of social functioning assessed across five-domains: emotion recognition, empathy, antisocial behaviour, sociability, and social conformity. Participants are required to rate on a 5-point Likert-type scale, the extent to which they agree with various statements (5 = Strongly Agree – 1 = Strongly Disagree). The SEQ was used to assess any premorbid differences between groups on social functioning ability. The SEQ has demonstrated sufficient internal consistency, Cronbach's α = .69 (Bramham et al., 2009).

Advanced Clinical Solutions Affect Naming (*ACS-AN;* Pearson, 2009). Affect naming required participants to respond to 24 photographs of faces by indicating (either verbally or by pointing) which basic emotion the individuals in the photo is experiencing (happy, sad, angry, afraid, surprised, disgusted, neutral). Scores ranged from 0-24, with one point awarded for each correct response. This task was used to identify any premorbid differences between groups on basic emotion perception ability. Any visual acuity issues would also be identified from this assessment. ACS-AN has demonstrated strong internal consistency, Cronbach's α = .90 (Kandalaft et al., 2012).

Primary Measure

Complex Audio Visual Emotion Assessment Task *(CAVEAT*: Rosenberg et al., 2019). The CAVEAT (see Appendix C) requires participants to view short video vignettes (ranging from 10-30 seconds) containing one or two actor scenes depicting one of twenty-two emotions (*positive*: amused, caring, confident, enjoyment, excited, flirtatious, happy, interested, positively surprised, proud, relieved; *negative*: angry, annoyed, baffled/unsure, contempt, disinterested/bored, disgusted, fearful/anxious, negatively surprised, sad, shy, and suspicious). Participants were first asked if the emotion displayed was positive or negative in valence. If the response to this initial question was incorrect, participants were then corrected. Participants were then asked to indicate which of the eleven emotions within that valence category corresponded to that displayed in the vignette. Each emotion is displayed in four trails, with 88 trials in total. The order of delivery was counterbalanced, with half of the participants beginning the CAVEAT at item 1 and the remaining half at item 45. Preliminary analysis of the CAVEAT in Traumatic Brain Injury (TBI) populations has produced

excellent internal consistency estimates (Cronbach's α = .85), and good construct validity (Rosenberg et al., 2019).

Procedure

Those who satisfied eligibility criteria were contacted by the researcher to discuss the requirements of participation. Once verbal informed consent was obtained, a suitable time for testing was arranged. Participants were asked to abstain from the following prior to testing to control for any extraneous factors: food for four hours, caffeine for eight hours, alcohol and over-the-counter medication for twenty-four hours, and nicotine for the duration of participation. Additionally, participants were asked to consume a low-fat meal prior to fasting and limit their water intake four hours before testing. One hour before testing, participants were asked to consume two slices of toast to assist with the control of metabolic differences.

The information sheet (see Appendix D) and consent form (see Appendix E) were provided to participants upon arrival to testing. Once written informed consent was obtained, participants' height and weight were checked to ensure the correct dose of alcohol was administered and they satisfied BMI inclusion requirements. Participants then signed a declaration of abstinence, their BrAC reading was taken, and TLFB was completed to ensure compliance with abstaining requirements.

To control for alcohol expectancy effects during baseline assessments a 150ml placebo beverage consisting of Angostura bitters, lime syrup, and soda water was then administered to participants. Three ml of vodka was floated on top of the beverage and the inside of the cup sprayed to simulate the smell and taste of alcohol. The BAES, SEQ, ACS, and baseline confidence questionnaire (see Appendix F) were then administered. An emotion rating task was also administered that required participants to indicate the valence of each emotion assessed in the CAVEAT. It was

at this stage any misunderstanding pertaining to emotion meaning was clarified. Participants were also specifically asked about contempt's meaning due to likely confusion pertaining to its label (Elfenbein & Ambady, 2002).

Participants were then administered one of two 750ml beverages: placebo or a beverage with an alcohol dose calculated to achieve an acute BrAC of .08% (calculated using the Widmark equation, see Appendix G; Dry et al., 2012). Four mls of Angostura bitters and 90mls of lime syrup were used to mask the presence of alcohol. The remaining liquid consisted of a mixture of soda and still water. Placebo beverages were again floated with 3mls of vodka and sprayed to give the impression of alcohol. Participants were instructed to consume the beverage within 10-minutes and not hold the liquid in their mouth for longer than five seconds. Participants were then placed in a separate room for a 50-minute absorption period, where they viewed a neutral video. This absorption period was to allow peak BrAC levels to be reached at the commencement of the CAVEAT (Schacht, Stoner, George, & Norris, 2010).

Immediately following the absorption period, a BrAC reading was taken, and the BAES and anticipatory awareness questionnaire (see Appendix H) completed. The CAVEAT was then administered. Following each trial, emergent awareness was assessed by asking participants to indicate on a scale of 0 (not at all confident) to 100 (absolutely confident) how confident they were of their judgement. Half-way through the CAVEAT, a BrAC reading was taken. At the completion of the CAVEAT, BrAC was recorded, and the BAES and BRS administered.

At the conclusion of testing, participants were informed if their beverage contained alcohol, and those in the placebo condition were discharged. Participants that received the alcoholic beverage were required to remain in the lab until a BrAC reading of .03 was achieved (.00 if on a provisional license).

Statistical Analysis

IBM SPSS statistics Version 24 was used to conduct all statistical analyses. Independent samples *t*-tests were used to investigate any differences between conditions on baseline and eligibility assessments. A 2 (condition: alcohol, placebo) × 3 (time: baseline, pre-CAVEAT, post-CAVEAT) × 2 (subscale: sedative, stimulant) full information maximum likelihood (FIML) mixed linear model (MLM) was used to analyse any differences between groups on BAES sedative and stimulation subscales. A 2 (condition: alcohol, placebo) × 11 (positive emotion type: excited, positively surprised, interested, confident, flirtatious, happy, proud, caring, amused, enjoyment, relieved) FIML MLM was used to ascertain whether emotion perception for positive valence emotions differed between conditions. Another 2 (condition: alcohol, placebo) × 11 (negative emotion type: annoyed, disgusted, shy, fearful/anxious, baffled/unsure, contempt, disinterested/bored, suspicious, angry, negatively surprised, sad) FIML MLM was used to ascertain whether emotion perception for negative valence emotions differed between conditions. A Sidak correction was applied to all post-hoc comparisons to control for Type I errors, thus alpha levels were maintained at $\alpha = .05$.

All data assumptions were checked. Where homogeneity of variance was violated for *t*-tests, equal variances not assumed statistic is reported. Compound symmetry covariance structure was used for BAES analysis. All analysis that examined participant responses across the 11 emotion types within either the positive or negative valence categories violated sphericity, as such an unstructured covariance structure was used for these analyses.

Analysis of Emotion Perception Accuracy Judgements. The current study employed Calibration analysis to examine the relationship between participants'

confidence judgements and accuracy for items on the CAVEAT. Calibration measures the degree-of-fit between subjective rating of performance (i.e., confidence) and actual performance (i.e., accuracy) (Weber & Brewer, 2003). Calibration can be indexed by calculation of the calibration statistic, over/under confidence (*O/U*) statistic, and resolution (Weber & Brewer, 2004). Perfect calibration occurs when the subjective rating of performance aligns perfectly with the observed performance (Baranski & Petrusic, 1994). Perfect calibration is observed when items that are assigned a 50% confidence judgement are correct 50% of the time. Resolution is calculated using the Adjusted Normalised Discrimination Index (ANDI) and provides an index of the degree that confidence judgements accurately discriminate correct from incorrect judgements (Palmer, Brewer, Weber, & Nagesh, 2013). The calibration statistic and *O/U* statistic assess the extent that subjective appraisals align with objective performance. The calibration statistic is an index of the degree of deviation from perfect calibration, ranging from 0 (perfect calibration) to 1 (Weber & Brewer, 2003). Whereas the *O/U* statistic reflects the extent that confidence judgements are inflated (over-confidence) or deflated (under-confidence) relative to performance accuracy. These values range from -1 to 1, with negative and positive values representing under- and over-confidence respectively (Palmer et al., 2013).

The current study examined the accuracy of participants' confidence judgements from the calculation of how well their confidence judgments discriminated correct and incorrect judgements (ANDI statistic) and how well they aligned with observed performance (Calibration and *O/U* statistics). Each of these values provide separate information pertaining to participants' metacognitive appraisals of performance, with values on one index being in no way suggestive of

values on another (Honan et al., 2017). Emergent awareness was assessed by calculation of all three calibration indexes across all twenty-two emotion types. Anticipatory awareness was calibrated across only valence type due to the limited range in responses limiting the efficacy of the analysis when performed across all twenty-two emotion types.

Results

Eligibility and Baseline Assessments

No significant differences between groups on the baseline confidence questionnaire, AUDIT, K10, TLFB, ACS-AN, and the five subscales of the SEQ were detected (see Table 2 for descriptive and inferential statistics).

Manipulation Checks

Alcohol participants (M = 3.84, SD = 1.71) reported having consumed a significantly greater number of standard drinks, as measured by the BRS, compared to placebo participants (M = 1.53, SD = 1.12), $t(56.88) = 6.58$, $p < 0.001$, $d = 1.60$ (equal variances not assumed statistic reported, Levene's $F = 4.45$, $p = .039$).

For the BAES, a significant 2 (condition: alcohol, placebo) × 3 (time: baseline, pre-CAVEAT, post-CAVEAT) × 2 (subscale: sedative, stimulant) interaction was found, $F(11, 311.16) = 10.92$, $p < .001$ (see Figure 1). Post-hoc comparisons indicated no significant differences between conditions on either sedative [$F(1, 227.58) = 0.06$, $p = .805$, $d = .08$] or stimulant [$F(1, 227.58) = 0.32$, $p = .571$, $d = .13$] subscales at baseline. Immediately prior to CAVEAT administration (Pre-CAVEAT), alcohol participants reported significantly greater sedation [$F(1, 227.58) = 4.34$, $p = .038$, $d = .49$] and stimulation [$F(1, 227.58) = 6.90$, $p = .009$, $d = .57$] compared to placebo participants. Immediately following CAVEAT administration (Post-CAVEAT), only a trend towards significance between

Table 2

Descriptive and Inferential Statistics for Eligibility and Baseline Assessments

	Alcohol			Placebo					
		95%CI			95% CI				
	M (SD)	*LL*	*UL*	*M (SD)*	*LL*	*UL*	*t*(66)	*p*	Cohen's *d*
AUDIT	5.71 (3.17)	4.60	6.81	7.24 (4.00)	5.84	8.63	1.75	.085	0.42
K10	13.47 (2.89)	12.46	14.48	15.18 (5.17)	13.39	16.96	1.70	.097	0.41
TLFB	18.75 (18.08)	12.44	25.06	31.87 (43.30)	16.76	46.97	1.63	.108	0.41
ACS Affect Naming	19.29 (2.30)	18.49	20.10	18.53 (2.61)	17.62	19.44	1.28	.205	0.31
SEQ									
Emotion Recognition	20.68 (2.86)	19.68	21.67	20.06 (3.23)	18.93	21.19	0.84	.675	0.20
Empathy	19.18 (2.54)	18.29	20.06	20.06 (5.59)	18.11	22.01	0.84	.461	0.20
Antisocial Behaviour	11.79 (2.47)	10.93	12.66	11.82 (2.08)	11.10	12.55	0.05	.958	0.01
Sociability	23.35 (2.85)	22.36	24.35	22.79 (2.13)	22.05	23.54	0.92	.363	0.22
Social Conformity	12.62 (1.28)	12.17	13.06	12.50 (1.29)	12.05	12.95	0.38	.706	0.09
Confidence Positive	70.41 (14.87)	65.23	75.60	73.11 (12.42)	68.78	77.45	0.81	.420	0.20
Confidence Negative	67.88 (15.04)	62.64	73.13	70.11 (11.82)	66.00	74.24	0.68	.449	0.16

Note. AUDIT = Alcohol Use Disorders Identification Test; K10 = Kessler Psychological Distress Scale; TLFB = Timeline Followback; ACS = Advanced Clinical Solutions; SEQ = Social Emotional Questionnaire; CI = confidence interval; *LL* = lower limit; *UL* = upper limit. Given homogeneity of variance on the K10 was violated [Levene's $F = 4.27$, $p = .044$], the equal variances not assumed statistic is reported.

conditions for reported sedation was detected [$F(1, 227.58) = 3.34$, $p = .069$, $d = .47$]. There was no significant difference for reported stimulation Post-CAVEAT [$F(1, 227.58) = 0.32$, $p = .571$, $d = .13$].

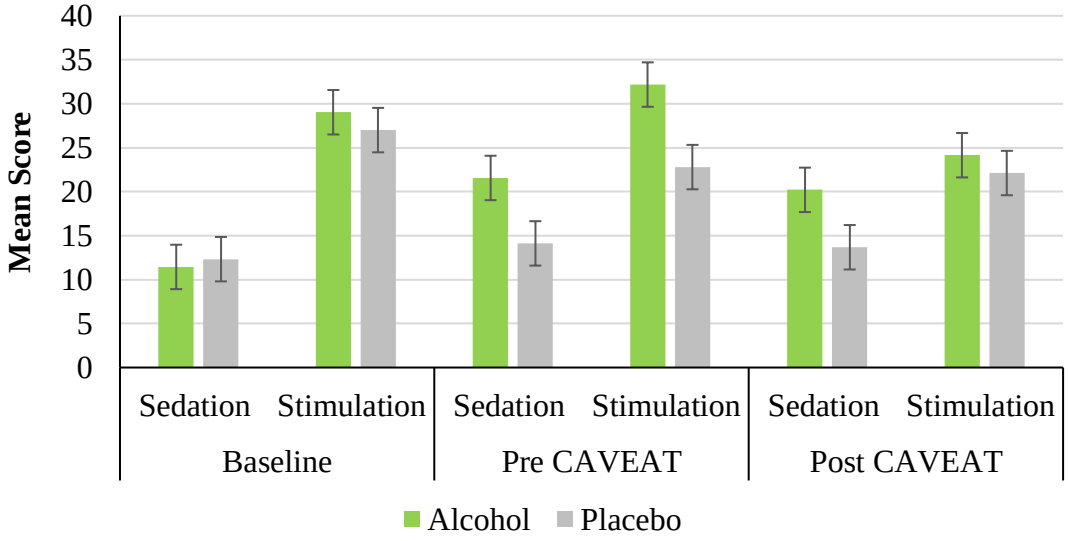

Figure 1. Means and standard errors for stimulant and sedative effects of alcohol for alcohol and placebo conditions for the duration of testing.

BrAC Readings

Placebo participants recorded a BrAC of .000 for the duration of testing. A series of one-samples *t*-tests demonstrated that the mean BrAC recordings for alcohol participants were different from zero at all three time points (pre-CAVEAT, mid-CAVEAT, post-CAVEAT) (see Table 3 for descriptive and inferential statistics). A repeated measures ANOVA found no significant difference between BrAC levels across time for alcohol participants, $F(1, 33) = 2.24$, $p = .144$, indicating that level of intoxication remained constant for the duration of testing.

Table 3

Descriptive Statistics and Results of Independent Samples t-Tests for Alcohol Condition BrAC Recordings

		95% CI			
	M (SD)	*LL*	*UL*	*t*(33)	*p*
Pre-CAVEAT	.068 (.02)	.062	.074	23.37	<.001
Mid-CAVEAT	.070 (.01)	.065	.075	27.33	<.001
Post-CAVEAT	.064 (.01)	.059	.069	25.22	<.001

Note. Pre-CAVEAT = BrAC recorded immediately prior to CAVEAT administration; Mid-CAVEAT = BrAC recorded exactly mid-way through CAVEAT task after the completion of Item 44; Post-CAVEAT recorded immediately following CAVEAT administration.

CAVEAT Performance

Initial Identification of Emotion Valence. The following analysis pertains to accuracy for the initial identification of positive vs. negative emotion valence. A 2 (condition: alcohol, placebo) × 2 (valence: positive, negative) mixed ANOVA found a significant main effect for emotion valence, with correct identification greater for negative (M = 41.63, SD = 1.38) than positive emotions (M = 40.46, SD = 1.47), $F(1, 66) = 18.78$, $p < .001$, $d = .70$. No significant main effect for condition [$F(1, 66) = 0.03$, $p = .861$, $d = .04$] or interaction [$F(1, 66) = 1.42$, $p = .238$] was found.

Identification Accuracy of Emotion Type. The following analyses pertain to accuracy rates for the correct identification of emotion type from the provided list of eleven positive and negative emotions. A 2 (condition: alcohol, placebo) × 2 (valence: positive, negative) MLM found no main effect for condition or valence for

overall accuracy, $F(1, 68) = 0.48$, $p = .492$, $d = .15$, and $F(1, 68) = 0.31$, $p = .577$, $d = .06$, respectively. The interaction was also not significant, $F(3, 87.85) = 0.35$, $p = .792$.

A 2 (condition: alcohol, placebo) × 11 (positive emotion type: amused, caring, confident, enjoyment, excited, flirtatious, happy, interested, positively surprised, proud, relieved) MLM detected a significant main effect for emotion type [$F(10, 68) = 86.67$, $p < .001$] (see Figure 2 for diagrammatical representation of main effect). Post-hoc comparisons indicated two major clusters of emotions based on mean correct scores across groups. Relived, flirtatious, positively surprised, enjoyment, and amused were the easiest for participants to detect. Whereas, interested, confident, excited, happy, and proud were the most difficult emotions to detect. Accuracy rates were significantly different between both major clusters, all *p*s < .05, and no two emotions within a cluster had significantly different accuracy rates. Caring was moderately difficult to detect and did not fall within one cluster. No significant main effect for condition [$F(1, 68) = 0.63$, $p = .430$, $d = .06$] was detected. There was a significant interaction between condition and emotion type [$F(20, 68) = 43.99$, $p = < .001$]. However, inspection of post-hoc comparisons found no significant differences between groups for isolated emotions, all *p*s > .05.

Another 2 (condition: alcohol, placebo) × 11 (negative emotion type: annoyed, disgusted, shy, fearful/anxious, baffled/unsure, contempt, disinterested/bored, suspicious, angry, negatively surprised, sad) MLM found a significant main effect for emotion type [$F(10, 68) = 115.00$, $p < .001$] (see Figure 3 for diagrammatical representation of main effect). Post-hoc comparisons indicated disinterested/bored and fearful/anxious as the easiest for participants to detect as indicated by near ceiling performances. Negatively surprised was the next easiest for

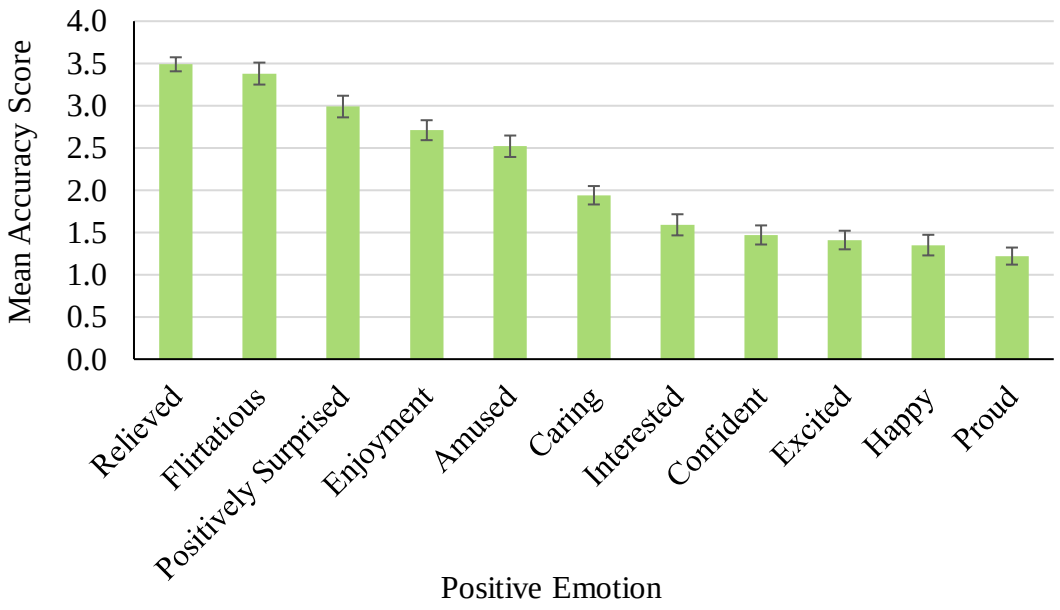

Figure 2. Means and standard errors for correct identification of eleven positive valenced emotions across groups. See Appendix I for emotion perception accuracy stratified by condition.

detection and was different from all remaining emotions except angry and annoyed. Angry was the next easiest to detect, and was different from all remaining emotions except annoyed, disgusted, and suspicious. Annoyed, disgusted, suspicious, sad, baffled/unsure, and shy were all moderately difficult for participants to detect, and their accuracy rates were not significantly different from each other, all *p*s > .05. Contempt was the hardest emotion type to detect, as indicated by its near floor effects across conditions. No significant main effect for condition [$F(1, 68) = 0.15$, $p = .698$, $d = .02$] was detected. There was a significant interaction between condition and emotion type [$F(20, 68) = 57.79$, $p < .001$]. However, inspection of post-hoc comparisons indicated no significant difference between groups for the accurate detection of each emotion type.

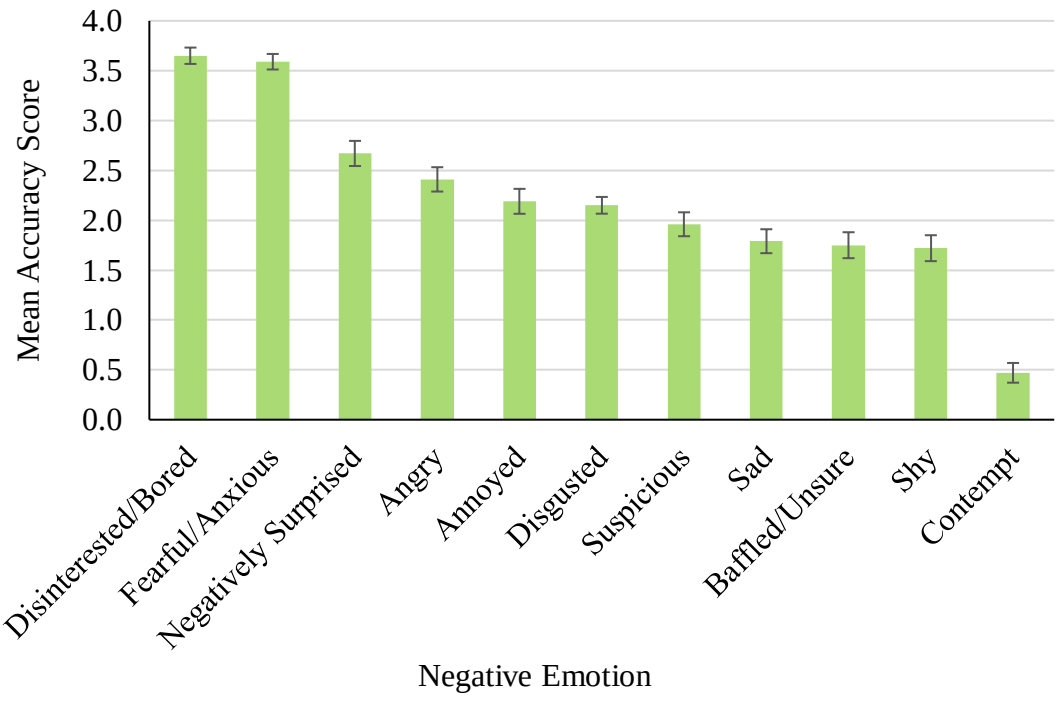

Figure 3. Means and standard errors for correct identification of eleven negative valenced emotions across groups. See Appendix J for emotion perception accuracy stratified by condition.

Labelling Errors

Information pertaining to the mislabelling of positively valenced emotions is displayed in Table 4. Visual inspection of this information indicates similar errors in labelling across alcohol and placebo groups. Specifically, proud was consistently mislabelled as confident. Happy was commonly mislabelled as excited and proud. Alcohol participants also commonly mislabelled happy as positively surprised, this trend was not as pronounced in the placebo condition (12% and 6% respectively).

Information pertaining to the mislabelling of negatively valenced emotions is displayed in Table 5. Visual inspection of this information indicates similar errors in

labelling across alcohol and placebo groups. Contempt had the lowest percentage correct labelling for both the alcohol and placebo condition (15% and 8% respectively). Both groups tended to mislabel contempt as annoyed, disgusted, and angry. Mislabelling of sad was dispersed across annoyed, shy, fearful/anxious, and baffled/unsure. Shy tended to be mislabelled as fearful/anxious.

Calibration Analyses

Accuracy of Emergent Awareness Confidence Ratings. One-samples *t*-tests indicated that the ANDI values for both alcohol (M = .54, SD = .08) and placebo (M = .56, SD = .07) participants were significantly different from zero, $t(33) = 37.58$, $p < .001$, 95% CI [.51, .57], and $t(33) = 44.70$, $p < .001$, 95% CI [.54, .58], respectively. Furthermore, this value demonstrates 54% of the variance in accuracy for the alcohol condition and 56% in the placebo condition can be attributed to confidence ratings.

A significant Calibration value for both the alcohol (M = .07, SD = .05) and placebo (M = .07, SD = .05) condition indicated subjective ratings of performance accuracy did not coincide with actual performance accuracy, with both these values significantly different from zero, $t(33) = 7.78$, $p < .001$, 95% CI [.05, .09] and $t(33) = 7.71$, $p < .001$, 95% CI [.05, .08], respectively.

Finally, a significant *O/U* value of M = .19 (SD = .06) for the alcohol condition and M = .19 (SD = .12) for the placebo condition illustrated slight overconfidence in both conditions' perceptions of performance. Both these values were significantly different from zero, $t(33) = 9.54$, $p < .001$, 95% CI [.15, .23] and $t(33) = 9.13$, $p < .001$, 95% CI [.14, .23], respectively.

Table 4

Percentage of Error Types for Alcohol and Placebo Groups for Eleven Positive Valenced Emotions

		Label assigned by participant (%)										
Condition	Actual Emotion	1	2	3	4	5	6	7	8	9	10	11
Alcohol	Positively Surprised (1)	**72**	1	1	15	0	0	3	7	0	0	0
	Amused (2)	9	**66**	4	2	1	0	12	2	1	1	2
	Enjoyment (3)	3	1	**68**	0	1	1	18	1	6	0	1
	Excited (4)	31	3	1	**40**	1	0	8	10	1	4	0
	Caring (5)	10	1	1	2	**50**	12	5	7	1	7	2
	Flirtatious (6)	1	1	4	0	1	**85**	2	1	0	4	1
	Happy (7)	12	4	10	17	4	1	**28**	6	2	3	12
	Interested (8)	35	3	1	1	5	0	1	**51**	1	1	1
	Relieved (9)	7	1	2	1	0	1	1	1	**84**	1	1
	Confident (10)	10	7	1	2	1	0	3	18	6	**40**	10
	Proud (11)	12	15	4	1	1	1	6	2	2	24	**30**
Placebo	Positively Surprised	**78**	4	0	13	0	0	3	2	0	0	0
	Amused	2	**63**	5	8	5	1	16	1	1	0	0
	Enjoyment	1	4	**68**	1	0	0	16	1	9	0	0
	Excited	31	3	2	**34**	1	0	17	5	1	4	1
	Caring	13	1	2	1	**52**	11	7	2	2	6	1
	Flirtatious	0	2	2	1	0	**88**	3	3	0	1	2
	Happy	6	10	3	15	1	1	**39**	5	2	2	17
	Interested	31	8	0	0	2	0	4	**51**	2	2	2
	Relieved	3	1	0	2	0	0	1	0	**91**	2	2
	Confident	9	4	1	2	2	2	11	13	6	**36**	14
	Proud	14	5	4	0	2	0	12	3	5	23	**32**

Note. Values are rounded to the nearest whole number and represent average performance across the four trails pertaining to each emotion type. Numbers in bold represent correct responses.

Table 5

Percentage of Error Types for Alcohol and Placebo Groups for Eleven Negative Valenced Emotions

		Label assigned by participant (%)										
Condition	Actual Emotion	12	13	14	15	16	17	18	19	20	21	22
Alcohol	Annoyed (12)	**54**	6	0	0	0	9	3	0	14	13	1
	Disgusted (13)	10	**53**	0	6	10	2	1	2	1	11	4
	Shy (14)	3	1	**49**	25	10	0	1	1	0	5	4
	Fearful/anxious (15)	1	0	1	**89**	2	1	0	1	1	1	4
	Baffled/unsure (16)	5	1	11	15	**52**	1	5	7	0	1	1
	Contempt (17)	43	20	0	0	0	**15**	2	1	14	5	0
	Disinterested/bored (18)	2	0	0	1	1	2	**92**	1	1	0	0
	Suspicious (19)	7	7	1	2	19	7	1	**46**	0	9	1
	Angry (20)	26	2	0	1	0	11	0	0	**57**	1	0
	Negatively Surprised (21)	2	1	0	2	17	2	0	4	0	**71**	0
	Sad (22)	13	0	13	9	12	4	2	1	1	1	**46**
Placebo	Annoyed	**56**	3	0	0	1	7	4	0	15	14	0
	Disgusted	7	**54**	0	3	11	3	1	0	1	10	10
	Shy	1	0	**49**	24	11	1	1	1	0	4	7
	Fearful/anxious	0	0	1	**91**	1	0	0	1	0	0	7
	Baffled/unsure	9	1	11	9	**47**	2	4	12	0	3	2
	Contempt	43	24	0	0	1	**8**	4	2	12	4	1
	Disinterested/bored	3	1	0	1	3	1	**90**	0	1	0	1
	Suspicious	10	2	1	1	21	4	1	**54**	1	4	2
	Angry	24	5	1	0	0	7	0	0	**63**	0	0
	Negatively Surprised	1	1	0	1	15	0	0	6	1	**73**	2
	Sad	11	1	12	8	13	1	6	0	4	0	**45**

Note. Values are rounded to the nearest whole number and represent average performance across the four trails pertaining to each emotion type. Numbers in bold represent correct responses.

Effects of Alcohol on Emergent Awareness of Emotion Perception Accuracy

ANDI Statistic. A 2 (condition: alcohol, placebo) × 11 (positive emotion type: amused, caring, confident, enjoyment, excited, flirtatious, happy, interested, positively surprised, proud, relieved) MLM found no significant main effect for condition or emotion type, $F(1, 77.43) = 1.45$, $p = .232$, $d = .12$ and $F(10, 488.95) = 1.40$, $p = .176$, respectively. The interaction was also not significant, $F(21, 501.27) = 1.18$, $p = .267$.

Another 2 (condition: alcohol, placebo) × 11 (negative emotion type: annoyed, disgusted, shy, fearful/anxious, baffled/unsure, contempt, disinterested/bored, suspicious, angry, negatively surprised, sad) MLM found no significant main effect for condition, $F(1, 91.77) = 1.16$, $p = .284$, $d = .16$. A significant main effect for emotion type was found, $F(10, 478.23) = 1.92$, $p = .040$, however inspection of post-hoc comparisons indicated no significant difference between isolated emotions, all ps > .05. The interaction was also not significant, $F(21, 453.22) = 1.38$, $p = .121$.

Calibration Statistic. A 2 (condition: alcohol, placebo) × 11 (positive emotion type: amused, caring, confident, enjoyment, excited, flirtatious, happy, interested, positively surprised, proud, relieved) MLM showed no significant main effect for condition, $F(1, 68) = .28$, $p = .597$, $d = .06$. A significant main effect of emotion type was found, $F(10, 68) = 24.31$, $p < .001$. A significant interaction between emotion type and condition was also found, $F(21, 75.60) = 12.20$, $p < .001$. However, post-hoc comparisons indicated no significant difference between conditions for how their subjective ratings of performance corresponded with their actual performance across each emotion type, all ps > .05.

A 2 (condition: alcohol, placebo) × 11 (negative emotion type: annoyed, disgusted, shy, fearful/anxious, baffled/unsure, contempt, disinterested/bored, suspicious, angry, negatively surprised, sad) MLM found no significant main effect for condition, $F(1, 68) = .53$, $p = .470$, $d = .06$. A significant main effect for emotion type was found, $F(10, 680) = 8.03$, $p < .001$. A significant interaction effect was also detected, $F(21, 73.83) = 15.39$, $p < .001$. However, post-hoc comparisons indicated no significant difference between conditions for how their subjective ratings of performance corresponded with their actual performance across each emotion type, all ps > .05.

***O/U* Statistic.** A 2 (condition: alcohol, placebo) × 11 (positive emotion type: amused, caring, confident, enjoyment, excited, flirtatious, happy, interested, positively surprised, proud, relieved) MLM found no significant main effect of condition, $F(1, 68) = .01$, $p = .941$, $d < .01$. A significant main effect for emotion type was detected, $F(10, 68) = 52.71$, $p < .001$. A significant interaction was also found, $F(21, 70.09) = 25.61$, $p < .001$. However, inspection of post-hoc comparisons indicated no significant difference between groups over/under estimation of their performance accuracy across emotion type, all ps > .05.

A 2 (condition: alcohol, placebo) × 11 (negative emotion type: annoyed, disgusted, shy, fearful/anxious, baffled/unsure, contempt, disinterested/bored, suspicious, angry, negatively surprised, sad) MLM found no significant main effect of condition, $F(1, 68) = .00$, $p = .996$, $d < .001$. A significant main effect for emotion type was detected, $F(10, 68) = 42.75$, $p < .001$. A significant interaction was also found, $F(21, 71.95) = 20.60$, $p < .001$. However, inspection of post-hoc comparisons indicated no significant difference between groups over/under estimation of their performance accuracy across emotion type, all ps > .05.

Effects of Alcohol on Anticipatory Awareness of Emotion Perception Accuracy

ANDI Statistic. A 2 (condition: alcohol, placebo) × 2 (valence: positive, negative) MLM found no significant main effect for condition or valence, $F(1, 70.44) = .60$, $p = .442$, $d = .21$ and $F(1, 66.63) = .02$, $p = .880$, $d < .001$, respectively. No significant interaction was detected, $F(3, 87.78) = .26$, $p = .853$, $d < .001$.

Calibration Statistic. A 2 (condition: alcohol, placebo) × 2 (valence: positive, negative) MLM found a significant main effect for condition, $F(1, 68) = 5.84$, $p = .018$, $d = .57$, such that alcohol condition participants' ($M = .33$, $SD = .15$) subjective appraisals of anticipated performance better aligned with their actual performance compared to those in the placebo condition ($M = .43$, $SD = .20$). The main effect for valence was not significant, $F(1, 68) = 2.69$, $p = .106$, $d = .13$. The interaction was significant, $F(3, 78.73) = 3.04$, $p = .034$. This interaction effect is diagrammatically represented in Figure 4. Inspection of post-hoc comparisons indicated that subjective appraisals of expected performance in alcohol participants better aligned with actual performance for both negative valence emotions [$F(1, 92.05) = 6.38$, $p = .013$, $d = 0.63$] and positive valence emotions [$F(1, 68) = 5.84$, $p = .018$, $d = 0.50$], than in placebo participants.

***O/U* Statistic** A 2 (condition: alcohol, placebo) × 2 (valence: positive, negative) MLM detected a trend for the main effect of condition, $F(1, 68) = 3.42$, $p = .069$, $d = .40$, such that the placebo condition ($M = .51$, $SD = .17$) overestimated their actual performance more so than the alcohol condition ($M = .44$, $SD = .18$). There was also a main effect of valence, with participants overestimating their anticipated performance for positive valenced emotions ($M = .54$, $SD = .16$), significantly more than negative valenced emotions ($M = .42$, $SD = .17$), $F(1, 68) = 61.17$, $p < .001$, $d = 0.73$. A significant interaction effect was also detected, $F(3,$

77.46) = 21.63, $p < .001$. This interaction effect is diagrammatically represented in Figure 5. Inspection of post-hoc comparisons indicated only a trend for those participants in the placebo condition ($M = .57$, $SD = .13$) to overestimate their actual ability for positively valenced emotion types more so than those in the alcohol condition ($M = .50$, $SD = .19$), $F(1, 89.78) = 3.68$, $p = .058$, $d = 0.43$. No difference was detected between conditions for negatively valenced emotion types, $F(1, 89.78) = 2.27$, $p = .136$.

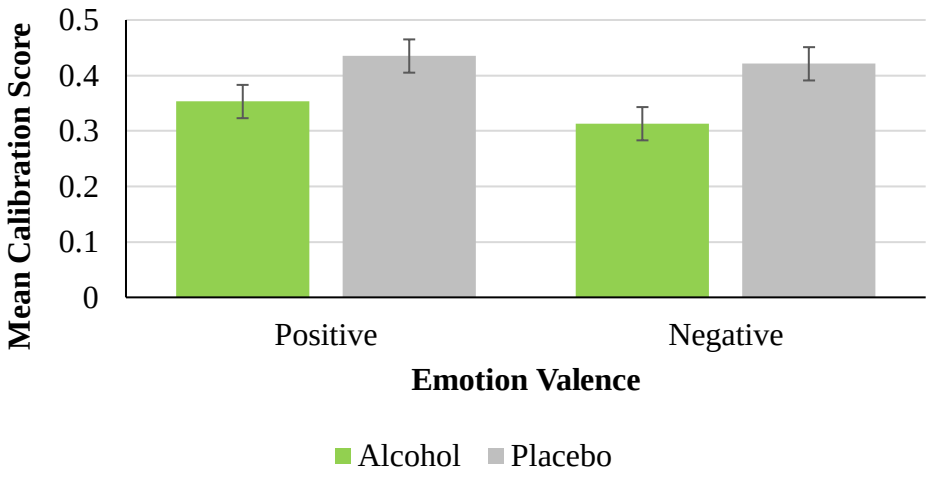

Figure 4. Means and standard errors for the Calibration statistic for alcohol and placebo conditions for emotion valence.

Discussion

The current study investigated the effect of acute high-dose alcohol-intoxication on emotion perception ability across twenty-two basic and secondary emotion types. Its primary aim was to build on current understanding of acute alcohol induced deficits in emotion perception ability by using a more ecologically valid assessment of emotion perception that assesses a broader range of emotion types. Online awareness of these abilities were also examined. Results from this

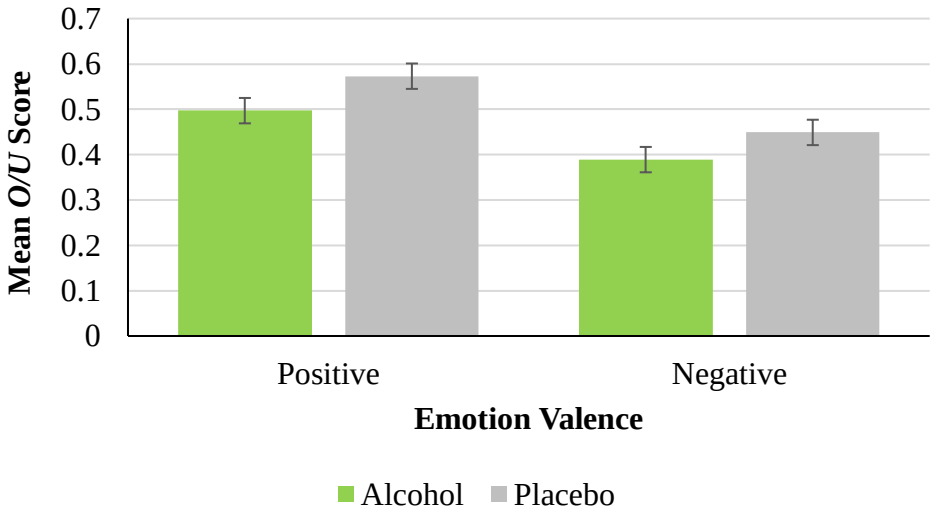

Figure 5. Means and standard errors for the *O/U* statistic for alcohol and placebo conditions for emotion valence.

study will aid in the refinement of current understanding pertaining to the underlying mechanisms responsible for alcohol's contribution to negative social behaviours.

The results of this study relating to the first hypothesis that acute high-dose alcohol-intoxication would impair emotion perception ability, both for fear and sadness, as well as all secondary emotion types, was not supported. In fact, a similar pattern of abilities and misclassification errors were found across both conditions. These findings are consistent with the prior results of Walter et al. (2011) and Kamboj et al. (2013) who also detected no effect of acute high-dose alcohol-intoxication on the ability to accurately perceive basic emotions in others.

These results are, however, inconsistent with alternative studies that have demonstrated impairments in the ability to perceive fearful and sad facial expressions (Attwood et al., 2009; Craig et al., 2009; Honan et al., 2017). Honan et al. (2017) rationalised that impairments in the ability to detect fear and sadness were particularly relevant for the AMM, a prominent theory suggesting alcohol-

intoxication causes a narrowing of perceptual monitoring, resulting in only the most salient information being attended to (Giancola et al., 2011). This was based on the notion that fear and sadness are the least discernible, and thus less salient, facial emotional expressions of the basic emotion types (Montagne, Kessels, De Hann, & Perrett, 2007). Based on this line of reasoning, it was further rationalised that the ability to detect secondary facial emotion types, that are also thought to be less salient (Giancola et al., 2011), would also be prone to impairments in alcohol-intoxicated individuals.

The lack of impairments found in emotion perception ability may be due to the contextualisation of emotional displays in the current study. Previous research examining emotion perception ability in alcohol-intoxicated individuals have typically used laboratory based facial recognition tasks where participants are provided with facial emotional expressions void of any contextual information (Kamboj et al., 2013; Walter et al., 2011). The current study, however, employed a more ecologically valid task containing emotional expressions that are contained within enriched social scenes. Given deficits in emotion perception following alcohol-intoxication were not detected in the current study, it appears the alcohol participants were able to use the contextual information available to compensate for any pending deficits in emotion perception ability (i.e., as has been observed when only a facial stimulus is presented in prior studies). Indeed, research in healthy non-intoxicated individuals has demonstrated that the addition of contextual information, such as tone of voice and body posture, can enhance emotion perception due to the additional cues available (Barret et al., 2011; Burgoon et al., 2002). Thus, the current findings suggest that these enhancement effects also translate to acutely intoxicated individuals.

The possible enhancement effect of contextual information opposes predictions of the AMM. Specifically, rather than narrowing perceptual attention to focus on what is most salient in the social scene, intoxicated participants appeared to take additional environmental cues into account that in turn may have facilitated their emotion perception ability. This suggests that their attentional focus is perhaps broader than what AMM proposes. It is also plausible, however, that the environmental cues enhanced the salience of the emotion being displayed. In this respect, it may not be the narrowing of perceptual attention that applies to the alcohol-intoxicated individual, but rather a focus on what is salient information, of which peripheral perceptual cues contribute to. Notwithstanding, the current findings have implications for the prominent AMM and indicate that further research is required to understand if, and how, impaired emotion perception may contribute to negative social behaviours in alcohol-intoxicated individuals. One criticism of the current study was that a direct comparison between emotions in a static vs. contextual environment was not made. Such a comparison is essential for future research.

One study finding worthy of further discussion is the near floor effects for the detection of contempt. Contempt's expression is conveyed by a unilateral lip raise and tightening (Matsumoto & Ekman, 2004). It is a relatively nuanced expression (Rosenberg & Ekman, 1995) that is known to be easily confused with disgusted or annoyed (Matsumoto & Ekman, 2004). The results from the current study illustrate consistent inaccuracy when responding to contempt trials across both intoxicated and placebo participants. While a misunderstanding of contempt's meaning may account for these results, this is unlikely as contempt's definition was specifically clarified prior to CAVEAT administration. Some have suggested that low accuracy in

perceiving contempt pertains more to knowing when and if contempt's label should be applied, as opposed to perceiving the emotion itself as alternative emotions such as disgust or annoyed (Wagner, 2000). Indeed, researchers have found that when participants are asked to select between situational descriptions as opposed to singular labels, contempt is more accurately identified (Rosenberg & Ekman, 1995). This suggests a lack of familiarity with the word 'contempt', which may be overcome when additional verbal contextual information is provided.

The current study also tested the hypothesis that metacognitive appraisals of task performance is impacted by acute alcohol-intoxication. Specifically, how alcohol-intoxication affects online awareness; the anticipation of performance (anticipatory awareness) and monitoring of performance errors (emergent awareness) (Toglia & Kirk, 2000). Whereas anticipatory awareness is assessed prior to task completion, emergent awareness is assessed while undertaking the task. In keeping with previous research that has demonstrated impairments in online awareness following acute alcohol-intoxication (Bartholow et al., 2012; Ridderinkhof et al. 2002; Honan et al., 2017), it was hypothesised that participants in the alcohol condition would show less anticipatory and emergent awareness of performance compared to placebo participants. The results of the current study however did not support this prediction in relation to emergent awareness. Specifically, while undertaking the CAVEAT, both the intoxicated and placebo participants gave similar metacognitive judgements of their performance accuracy.

Contrary to expectations, however the alcohol-intoxicated participants had better levels of anticipatory awareness than the placebo participants. That is, alcohol participants' self-ratings of expected performance better aligned to their actual task performance (i.e., as indicated by the calibration statistic) than placebo participants.

Placebo participants also tended to be more over-confident with their expected performance than alcohol participants (i.e., as indicated by the *O/U* statistic). Given alcohol participants were more aware of their "likely" compromised emotion perceptual abilities prior to performing the CAVEAT, it is highly possible that they engaged in more deliberate monitoring of their performance and thus were able to better adjust their responding accordingly.

These findings of enhanced awareness in alcohol-intoxicated participants contradicts prior findings that have demonstrated reduced anticipatory awareness for performance accuracy following acute alcohol consumption (Bartholow et al., 2012; Hull, 1981). The discrepant results between the prior literature and the current study may reflect *how* participants predicted that their performance would be altered following alcohol-intoxication. Indeed, research has demonstrated that when individuals believe something will influence their ability (e.g., alcohol) they are able to incorporate this into their judgements about future performance (i.e., become more reserved with confidence judgements) (referred to as *theory-based* metacognitive judgements; Palmer et al., 2013). Research has also illustrated that anticipation of alcohol's effects on performance can lead to participants becoming hypervigilant, paying more attention to foreseen deficits and exerting more effort to counteract such effects (Testa et al., 2006). Thus, alcohol participants may have been more reserved in their anticipatory confidence judgements due to their expectation about alcohol negatively affecting their performance.

The current study used the BAES to monitor self-reported experiences of sedation and stimulation effects associated with alcohol-intoxication. Thus, the abovementioned results must be interpreted in view of both conditions' performance on this manipulation assessment. No differences between conditions were found for

reported sedative and stimulant effects at baseline. Immediately preceding the CAVEAT (50 minutes post-ingestion), alcohol participants reported significantly greater experiences of stimulation and sedation, validating the study's experimental manipulation. At the conclusion of the CAVEAT, a trending effect was found for sedation, such that alcohol participants reported greater effects compared to placebo participants, however no difference for stimulation was detected. Such results are in keeping with how high-dose alcohol would be expected to perform based on prior studies. Specifically, sedative effects are commonly experienced following high-doses of alcohol at peak levels of intoxication and on the descending limb (Hendler, Ramchandani, Gilman, & Hommer, 2011). Both alcohol and placebo participants also reported consuming alcohol throughout the duration of the experiment, albeit with the alcohol participants reporting more consumption. As such, the results from the current study can be interpreted with confidence that both the alcohol and placebo manipulation functioned as intended.

Study Implications

Facial displays of emotion supplement social communication by conveying information about the intention and receptiveness of another (Attwood et al., 2009). Thus, the ability to accurately detect emotion displays is essential for effective social communication (Attwood & Munafò, 2014). As such, the appeared ability of contextual information to compensate for alcohol-induced deficits in emotion perception suggests that intoxicated individuals can source this social information from other contextual factors, such as tone of voice and body posture. The current study's sample, however, was largely composed of university educated, non-clinical members of the general population. Thus, future research may wish to investigate whether the addition of contextual information is enough to compensate for emotion

perception impairments in more high-stakes populations, such as individuals prone to aggression.

Of importance is the current study's finding that alcohol-intoxicated individuals displayed the equivalent amount of insight into their emergent performance as did those in the placebo condition. Such results are likely owing to the superior exhibit of anticipatory awareness from alcohol participants before the initiation of testing. The results suggest that when prompted to consider future performance accuracy, alcohol participants were able to consider their temporary deficits (i.e. alcohol-intoxication) and the impact these may have on future performance. Crucially, they also displayed more awareness later when completing these tasks, indicating that additional performance monitoring may have been taking effect. These findings provide invaluable insight that could assist in the development of government policies and interventions to better manage the negative social consequences of alcohol-intoxication. As these results suggest people can acknowledge likely alcohol-related deficits when prompted and accurately account for these in future performance, future campaigns designed to increase awareness of alcohol-induced cognitive deficits and encourage greater insight into *how* these deficits may impair functioning could encourage greater reserve and caution from individuals when intoxicated.

Study Limitations

The current study is limited in-so-far that the accuracy score for each emotion reflected performance on only four trials. While the CAVEAT addressed the previously limited range of emotions traditionally assessed in emotion perception tasks (Rosenberg et al., 2019), fewer trials were used to assess perception for individual emotion types. Thus, future research should aspire to assess perceptual

ability for each emotion type across a greater number of trails to gain a more accurate measure of this ability.

While the CAVEAT was more ecologically valid than previous assessment tasks (Rosenberg et al., 2019), the assessment did not perfectly reflect the contextual environment that one would generally be exposed to when intoxicated. Such concern is drawn from two aspects of the CAVEAT. Firstly, the testing environment that participants were in produced a more high-stakes context, where pressure to perform well may have led to participants exerting more control over their responding. It may be that when attempting the same task outside of the testing environment (i.e. attempting to perceive the emotions of another in daily-life), those under the influence of acute alcohol-intoxication may not exert the same level of control and effort. Secondly, when imbedded in a social situation, an individual is required to negotiate several factors, notably maintaining a conversation and ignoring distractor stimuli (i.e., loud noise). As participants in the current study were situated in a distraction-free environment, they were able to devote almost all their cognitive effort to the task. It is well established that alcohol reduces cognitive resources (Giancola et al., 2011). Thus, when immersed in social conversation, intoxicated individuals may not possess sufficient cognitive resources to perform with the same level of accuracy when detecting emotions in others that was displayed in the current study. Future research may wish to explore this idea, by introducing situational distractors or increasing cognitive load during emotion perception tasks.

A further limitation of the current study is the use of a single high-dose of alcohol to achieve the desired BrAC recording. Previous research has also only employed a single dose method for inducing acute alcohol-intoxication (Honan et al., 2017; Kamboj et al., 2013; Walter et al., 2011). Research has demonstrated that

alcohol when taken in a single high-dose as opposed to incremental consumption of smaller doses can impact cognitive functioning differently (Montgomery, Fisk, Murphy, Ryland, & Hilton, 2012; Volkow et al., 2006). This is important, as when socially drinking, individuals are more inclined to follow a drinking pattern similar to the latter. Thus, how participants performed following a singular high-dose in the current study may not reflect the same response pattern that would be observed if alcohol-intoxication was achieved over a prolonged time period following consumption of multiple smaller alcohol doses.

Conclusion

Alcohol is implicated in an array of negative social behaviours, however the exact mechanisms underlying this relationship are poorly understood. Previous research using static and morphed images have demonstrated impairment in emotion perception following acute high-dose alcohol-intoxication and have rationalised such deficits to account for the impaired social functioning associated with intoxication. The current study extended on these findings, demonstrating that the addition of contextual information aids in emotion perception thus allowing alcohol participants to compensate for any impairments in detecting subtle facial cues. This study also found that alcohol participants demonstrated greater anticipatory awareness than placebo participants. It appeared that the initial questioning prior to testing also prompted alcohol participants to display greater emergent awareness when making confidence judgements during testing than has previously been demonstrated in the literature. Such knowledge could inform future government policies and interventions to address alcohol's involvement in negative social behaviours.

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Appendices

Appendix A: Ethics Approval

Office of Research Services
University of Tasmania
Private Bag 1
Hobart Tasmania 7001
Telephone + 61 3 6226 7479
Facsimile + 61 3 6226 7148
Email Human.Ethics@utas.edu.au
www.research.utas.edu.au/human_ethics/

HUMAN RESEARCH ETHICS COMMITTEE (TASMANIA) NETWORK

UTAS

17 May 2016

Dr Cynthia Honan
C/o- Psychology

Sent via email

Dear Dr Honan

REF NO: H0015633
TITLE: Alcohol intoxication and social cognition: an examination of perception and response to social information

Document
Application Form – NEAF
Protocol – Alcohol Study
Psychology Peer Review

The Tasmanian Health and Medical Human Research Ethics Committee considered and approved the above documentation on **10 May 2016** to be conducted at the following site(s):

University of Tasmania

Please ensure that all investigators involved with this project have cited the approved versions of the documents listed within this letter and use only these versions in conducting this research project.

This approval constitutes ethical clearance by the Health and Medical HREC. The decision and authority to commence the associated research may be dependent on factors beyond the remit of the ethics review process. For example, your research may need ethics clearance from other organisations or review by your research governance coordinator or Head of Department. It is your responsibility to find out if the approvals of other bodies or authorities are required. It is recommended that the proposed research should not commence until you have satisfied these requirements.

All committees operating under the Human Research Ethics Committee (Tasmania) Network are registered and required to comply with the *National Statement on the Ethical Conduct in Human Research* (NHMRC 2007 updated 2014).

Therefore, the Chief Investigator's responsibility is to ensure that:

(1) The individual researcher's protocol complies with the HREC approved

protocol.

(2) Modifications to the protocol do not proceed until **approval** is obtained in writing from the HREC. Please note that all requests for changes to approved documents must include a version number and date when submitted for review by the HREC.

(3) Section 5.5.3 of the National Statement states:

Researchers have a significant responsibility in monitoring approved research as they are in the best position to observe any adverse events or unexpected outcomes. They should report such events or outcomes promptly to the relevant institution/s and ethical review body/ies and take prompt steps to deal with any unexpected risks.

The appropriate forms for reporting such events in relation to clinical and non-clinical trials and innovations can be located at the website below. All adverse events must be reported regardless of whether or not the event, in your opinion, is a direct effect of the therapeutic goods being tested. http://www.utas.edu.au/research-admin/research-integrity-and-ethics-unit-rieu/human-ethics/human-research-ethics-review-process/health-and-medical-hrec/managing-your-approved-project

(4) All research participants must be provided with the current Patient Information Sheet and Consent Form, unless otherwise approved by the Committee.

(5) The Committee is notified if any investigators are added to, or cease involvement with, the project.

(6) This study has approval for four years contingent upon annual review. A *Progress Report* is to be provided on the anniversary date of your approval. Your first report is due **10 May 2017.** You will be sent a courtesy reminder closer to this due date.

(7) A *Final Report* and a copy of the published material, either in full or abstract, must be provided at the end of the project.

Should you have any queries please do not hesitate to contact me on (03) 6226 2764.

Yours sincerely

Heather Vail
Ethics Administrator
Office of Research Services
Email: Heather.vail@utas.edu.au
University of Tasmania
Private Bag 01 Hobart Tas 7001

Appendix B: Study Advertisement

UTAS

Research Volunteers Wanted

Alcohol and Social Ability Study

Are you aged between 18-35 years?

Do you have some experience with alcohol?

We are looking for healthy volunteers to participate in a study investigating the effects of alcohol on social abilities such as emotion perception.

As a participant you will be asked to complete some brief baseline assessment tasks and questionnaires, consume some beverages (which may contain alcohol), and undertake some computer-based assessment tasks. The testing should take no longer than 2 hours to complete, although you must remain with the researchers until a BrAC level of .03% is achieved (0.0% for provisional licence drivers).

To volunteer or for more information, please email holly.emery@utas.edu.au

Receive 3 hours of research course credit for PSY111/112
OR a Village Cinemas movie ticket

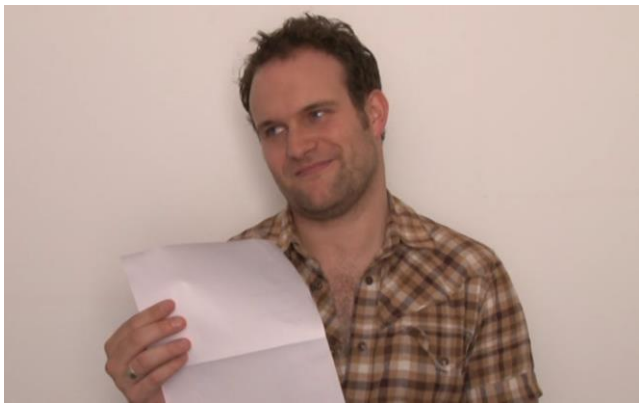
VILLAGE CINEMAS

This study has been approved by the Tasmanian Health and Medical Human Research Ethics Committee (#H0015633)

If you are interested, please follow the link provided, or alternately scan the QR code. This will direct you to a survey to assess eligibility to participate.

https://www.surveymonkey.com/r/GQKWMYY

Appendix C: CAVEAT Still Frames



Man displaying flirtatious.

Woman displaying caring.

Woman displaying interested.

Appendix D: Participant Information Sheet

School of Psychology
University of Tasmania

Information Sheet
The Impact of Alcohol Consumption on Social Ability

March 2019

Introduction

You are invited to participate in an experiment examining the effect of alcohol on social ability. The research is being conducted by Dr Cynthia Honan and Dr Matt Palmer. Assisting with the study are Research Assistants Miss Sarah Skromanis and Mr Jason Turner. Miss Holly Emery will also be assisting as partial fulfilment of the requirements of an Honours degree at the University of Tasmania. Sarah, Jason, and Holly are being supervised by Dr Cynthia Honan, a Clinical Neuropsychologist and Lecturer from the Discipline of Psychology, School of Medicine, University of Tasmania.

What is the purpose of the study?

The purpose of this study is to investigate how alcohol interferes with social ability. Emotion perception and theory of mind ability (ability to understand the thoughts and behaviours of others), and the ability to inhibit automatic social responding will be specifically examined. These abilities will be assessed using cognitive tasks.

Who can participate?

We are seeking participants who are:

- Aged 18-35 years
- Speak and read fluent English
- Completed Year 10 or equivalent
- Normal or corrected-to-normal vision
- Healthy (no history of significant neurological disorder or current psychiatric disorder,

significant intellectual disorder, alcohol/drug dependence, regular tobacco use, or chronic health problems)

- Regular alcohol consumers (minimum consumption of 2 standard alcoholic drinks on one occasion in the preceding month)
- Not currently using illicit drugs (i.e. use in the past six months)
- Not taking prescription medication (contraceptive medication allowed)
- Able to attend the Newnham campus of the University of Tasmania for 3 hours between 9am and 7pm (session lengths are an estimate only).

What does participation in the study involve?

This research will be conducted in Buildings O and N at the Newnham Campus, University of Tasmania. Interested individuals will complete some online screening questionnaires that will ask for your demographic details (e.g., age, sex, education), height and weight (to calculate Body Mass Index), medical history, psychological functioning, and use of alcohol. Eligible participants will be contacted to attend the Newnham campus for an experimental session conducted between 9am and 7pm.

Experimental sessions:

At the beginning of the session participants will consume a 150ml beverage before completing questionnaires asking about alcohol intake in the previous month, current mood, and level of self-interest, and brief cognitive tasks assessing basic emotion perception and inhibition ability. Participants will then be asked to consume a 750ml beverage that will contain either a placebo or alcohol. Alcohol administered will be a maximum of 6 standard alcoholic drinks. Participants will not be informed of the beverage content administered in each session until the conclusion of the session.

After consuming the beverage, participants will be asked to complete an emotion recognition task, and either tasks assessing inhibition ability or the ability to understand the thoughts and intentions of another person (theory or mind). A breathalyser will be used to monitor participants' breath alcohol concentration throughout the duration of the study. Throughout testing, participants will also be asked to complete several scales assessing their feeling of intoxication and impairment.

While it is estimated that the experimental tasks will take approximately 100 minutes to complete, some participants may be required to remain in the laboratory for a total of 3 hours to ensure each participant records two consecutive breath alcohol readings of .03% or less (.00% for Provisional licence holders intending to drive). These times are an estimate

only as individual rates of alcohol absorption and elimination may vary. Participants will be debriefed regarding the order of dose administration at the conclusion the session.

What are the restrictions regarding participating?

Participants will be asked to fast from food for 4 hours prior to each experimental session, although we ask that participants consume two slices of toast with their choice of spread 60 minutes prior to the session. Toast will be available from the researchers if required. Prior to fasting, a standard light meal devoid of high-fat or dairy products (e.g., a sandwich) is advised.

Participants will be asked to abstain from caffeine for 8 hours and alcohol and over-the-counter medication for 24 hours prior to each session. Participants will be asked to abstain from illicit drugs and tobacco for the duration of participation.

At the end of each session, participants will remain at leisure (with food and entertainment provided) until they attain two consecutive breathalyser recordings of 0.03% or less measured 15 minutes apart. Participants holding their provisional driver licence, who are intending to drive will be required to remain in the laboratory until two consecutive BrAC measurements are recorded at .00%. Participants holding their provisional licence who are not intending to drive, will be able to leave the laboratory at .03% BrAC if they sign a declaration in which they agree to be escorted by a nominated guardian to their place of residence and accompanied for a two hour period following session completion. The nominated guardian must be an adult aged 18 years or older who: (i) holds their provisional or full driver licence (ii) directly collects the participant from the research premises and meets the researcher in-person, and (iii) signs a declaration agreeing to escort the participant directly to their place of residence and accompany the participant for the two hour period following session completion. The researcher reserves the right to retain participants in the laboratory until .03% BrAC for those holding their full driver licence and .00% BrAC for those holding their provisional licence when it is deemed unsafe for the participant to leave at .03% BrAC.

What are the benefits of participating?

Your participation will help us enhance our knowledge of the effects of alcohol on social ability, and specifically, the mechanisms underlying social disinhibition, theory of mind and emotion perception. This knowledge can be used to educate people regarding the potential outcomes of alcohol intoxication on social functioning and will inform further research that aims to investigate alcohol related social difficulties.

What are the risks associated with participating?

There are no anticipated risks of this research. However, if in the unlikely event you experience negative side-effects, please inform the experimenter and the necessary assistance will be sought and provided. We ask that participants refrain from consuming alcohol or operating heavy machinery for four hours post-session.

Is there any reimbursement for participation?

Students of the University of Tasmania who are undertaking PSY111/112 unit will receive three hours of research participation credit for their time. Participants who are not undertaking PSY111/112 units will receive a Village Cinemas movie ticket as recompense for their time. Participants who do not complete the full schedule of sessions will not receive a movie ticket, unless withdrawal is necessary due to an unexpected adverse physiological reaction to the investigatory products.

How do I volunteer to participate? What if I want to withdraw from participating?

Participation in this study is voluntary. By signing the attached consent form, you are indicating that you are aware of the nature of the study and wish to participate. While we would be pleased to have you participate, we respect your right to decline. There will be no consequences to you if you decide not to participate. If you decide to discontinue participation at any time, you may do so without providing an explanation. However, you will be required to remain in the laboratory until your breath alcohol concentration measurement equals 0.03% or less on two separate occasions measured 15 minutes apart.

What will happen to the information I provide?

All information collected will be kept confidential. Each participant will be assigned a treatment code and individual participant data will be identifiable only by that code. All of the data will be stored on password protected secure computers or in a locked cabinet in the Department of Psychology, School of Medicine for a minimum of five years after the publication of any academic journal articles, at which point all questionnaires will be destroyed using a paper shredder and electronic data will be deleted. The screening questionnaire will be securely destroyed immediately on completion of the study and that any information provided by the participant on the questionnaire will be identifiable only by participant number, kept confidential, and viewed only by the experimenter.

Who do I contact if I have any queries?

If you would like to discuss any aspect of this study please contact Holly Emery (holly.emery@utas.edu.au), Sarah Skromanis (sarah.skromanis@utas.edu.au), and Jason Turner (jturner7@utas.edu.au). Alternatively, you can contact Dr Cynthia Honan on (03) 6324 3266 or by email cynthia.honan@utas.edu.au; or Dr Matt Palmer on (03) 6324 3004 or matt.palmer@utas.edu.au.

How do I find out the results of the study?

A summary of the results will be available on the Research webpage of the Discipline of Psychology, University of Tasmania (http://www.utas.edu.au/health/study/psychology). Results of the study can also be provided by contacting the researchers directly. Feedback on individual performance will not be provided.

Who do I contact if I have a complaint about the study?

This study has been approved by the Tasmanian Health and Medical Human Research Ethics Committee. If you have concerns or complaints about the conduct of this study should contact the Executive Officer of the HREC (Tasmania) Network on (03) 6226 7479 or email human.ethics@utas.edu.au. The Executive Officer is the person nominated to receive complaints from research participants. You will need to quote **H0015633**.

Who do I contact if I wish to speak to someone about my alcohol or drug use, or mental health?

As aforementioned, a number of simple screening questionnaires will be administered assessing psychological functioning and alcohol and other drug use. Whilst it is not anticipated that these questionnaires will cause distress, please do not hesitate to let the researcher know if you do not wish to fill them in. If you are concerned about your drinking or mental health, please contact the Tasmanian Alcohol Drug Information Service 1800 811 994 or Lifeline 13 11 14 (both services available 24 hours a day).

Thank you for taking the time to consider this study.

If you wish to take part in it, please sign the attached consent form.

This information sheet is for you to keep.

Appendix E: Participant Consent Form

School of Psychology
University of Tasmania

Consent Form

The Impact of Alcohol Consumption on Social Ability

1. I have read and understood the 'Information Sheet' for this project.
2. The nature and possible effects of the study have been explained to me.
3. I understand that because of my prior participation in eligibility screening session in which I have completed measures of psychological distress and alcohol use, as well as reporting my correct demographic data (age, sex, height and weight) that I am eligible to participate in the study.
4. I understand that I will be asked to abstain from food for 4 hours (and consume 2 slices of toast 60 minutes prior to the session), caffeine-containing products for 8 hours, and alcohol and prescription medication for 24 hours prior to each session, and illicit drugs and tobacco for the duration of the study.
5. I will be asked to sign a declaration and complete a breath alcohol concentration measurement (via a breathalyser) to confirm my abstinence at the start of each session.
6. I understand that in the experimental session I may be given a maximum of 6 standard alcoholic drinks, and that I will not be informed of the specific contents of the beverage until the conclusion of testing. I understand that after beverage consumption, I will be asked to complete a number of computerised laboratory behavioural performance tasks during which my behavioural responses will be recorded. I understand that my breath alcohol concentration (as measured via a breathalyser) will be recorded throughout the session, and that I will be asked about my perception of my intoxication and level of impairment.
7. I understand that the study involves attending the Newnham campus of the University of Tasmania (Buildings O and N) for one 100 minute experimental session.
8. I understand that I will be asked to remain in the laboratory until my blood alcohol concentration equals 0.03% or less on two occasions measured 15 minutes apart. This may mean remaining in the laboratory for approximately 3 hours in total.
9. I acknowledge that I have been advised to refrain from drinking alcohol or operating a vehicle or other heavy machinery for four hours after the end of the experimental session.
10. I understand that if I hold a provisional driver licence and I intend to drive I will be required to remain in the laboratory until my breath alcohol concentration is .00% on two consecutive occasions. I understand that if I hold a provisional driver licence and do not intend to drive I will be able to leave the laboratory at .030% BrAC after signing a declaration in which I agree to be escorted by my nominated legal adult to my place of residence and be accompanied for a two hour period following session

completion. I understand that the nominated legal guardian must be an adult aged 18 years or older who: (i) holds their provisional or full driver licence (ii) directly collects me from the research premises and meets the researcher in-person, and (iii) signs a declaration agreeing to escort me directly to my place of residence and accompany me for a two hour period following session completion. Furthermore, I understand that the researcher reserves the right to retain participants in the laboratory until .03% BrAC for those holding their full driver licence and .00% BrAC for those holding their provisional licence when it is deemed unsafe for the participant to leave at .03% BrAC. I acknowledge that I have been advised to refrain from drinking alcohol or operating a vehicle or other heavy machinery for four hours after the end of experimental sessions.

11. I understand that if I am a PSY111/112 student will receive three hours of research participation credit. If I am not a PSY111/112 student I understand that I will receive a Village Cinemas Movie ticket for my participation. If I withdraw from the study prior to concluding all sessions I will not be eligible for reimbursement, unless the withdrawal is due to an unexpected adverse event occurring as a consequence of ingesting the beverage.
12. I understand that, while there are no anticipated risks associated with this study, I should inform the experimenter immediately if any unexpected negative side-effects are experienced. I understand the experimenter will immediately cease the session and seek the necessary assistance.
13. I understand that the researchers will maintain my confidentiality and that any information I supply to the researcher(s) will be used only for the purposes of the research. My data will only be identifiable by an individual numerical participant code and I will not be able to obtain individual feedback of my results.
14. I understand that the screening questionnaire will be securely destroyed immediately on completion of the study and that any information I provide on the questionnaire will be identifiable only by my participant number, kept confidential, and viewed only by the experimenter.
15. I understand that all research data will be securely stored on the University of Tasmania premises for at least five years, and will then be securely destroyed when no longer required.
16. I agree that research data gathered from me for the study may be published provided that I cannot be identified as a participant.
17. I agree to participate in this investigation and understand that I may withdraw at any time without any effect, and if I so wish, may request that any data I have supplied to date be withdrawn from the research.
18. Any questions that I have asked have been answered to my satisfaction.

Name of Participant:

Signature: Date:

Statement by Investigator

☐ I have explained the project & the implications of participation in it to this volunteer and I believe that the consent is informed and that he/she understands the implications of participation

If the Investigator has not had an opportunity to talk to participants prior to them participating, the following must be ticked.

☐ The participant has received the Information Sheet where my details have been provided so participants have the opportunity to contact me prior to consenting to participate in this project.

Name of investigator: _____

Signature of investigator: _____ Date: _____

Appendix F: Baseline Confidence Questionnaire

Pre-task Questionnaire - Baseline

You will be shown some short scenes on a video. Each video will last 10 to 30 sec. You will be asked to pay attention to one person in the scene and nominate whether the person is feeling positive or negative.

1. On a scale from 0% (not at all confident) to 100% (completely confident), how confident are you that you will be able to correctly detect if the person is feeling...

a. positive? _____ % b. negative? _____ %

In addition to nominating whether the person in the scene is feeling positive or negative, you will also be asked to select an emotion that best describes how the person is feeling.

2. On a scale from 0% (not at all confident) to 100% (completely confident), how confident are you that you will be able to correctly detect if the person is feeling...

Negative emotions

a. annoyed? _____ %
b. disgusted? _____ %
c. shy? _____ %
d. fearful anxious? _____ %
e. Baffled/unsure? _____ %
f. Contempt? _____ %
g. Disinterested? _____ %
h. Suspicious? _____ %
i. Angry? _____ %
j. Negatively surprised? _____ %
k. Sad? _____ %

Positive emotions

l. Excited? _____ %
m. Positively surprised? _____ %
n. Interested? _____ %
o. Confident? _____ %
p. Flirtatious? _____ %
q. Happy? _____ %
r. Proud? _____ %
s. Caring? _____ %
t. Amused? _____ %
u. Enjoyment? _____ %
v. Relieved? _____ %

3. Imagine that you have had a few alcoholic drinks, just enough so that you are unable to legally drive. On a scale from 0% (not at all confident) to 100% (completely confident), how confident are you that you will be able to correctly detect if the person is feeling...

a. positive? _____ % b. negative? _____ %

Negative emotions

a. annoyed? _____ %
b. disgusted? _____ %
c. shy? _____ %
d. fearful anxious? _____ %
e. Baffled/unsure? _____ %
f. Contempt? _____ %
g. Disinterested? _____ %
h. Suspicious? _____ %
i. Angry? _____ %
j. Negatively surprised? _____ %
k. Sad? _____ %

Positive emotions

l. Excited? _____ %
m. Positively surprised? _____ %
n. Interested? _____ %
o. Confident? _____ %
p. Flirtatious? _____ %
q. Happy? _____ %
r. Proud? _____ %
s. Caring? _____ %
t. Amused? _____ %
u. Enjoyment? _____ %
v. Relieved? _____ %

Appendix G: Widmark Equation

Alcohol Dose (mg) = $W\rho(C1 + \beta t)$	
W	Participants body weight (kg),
ρ	Distribution of alcohol in the body,
C1	target breath alcohol concentration (BrAC; g/100mL),
t	Time (Hours),
β	Rate of alcohol elimination. Set at 0.015g/100mL/hour.

Note: Final alcohol dose (mg) is divided by 0.8 to achieve a dose in millilitres.

Appendix H: Anticipatory Awareness Questionnaire

Pre-task Questionnaire – Post Administration

You will be shown some short scenes on a video. Each video will last 10 to 30 sec. You will be asked to pay attention to one person in the scene and nominate whether the person is feeling positive or negative.

1. On a scale from 0% (not at all confident) to 100% (completely confident), how confident are you that you will be able to correctly detect if the person is feeling...

a. positive? _____ % b. negative? _____ %

In addition to nominating whether the person in the scene is feeling positive or negative, you will also be asked to select an emotion that best describes how the person is feeling.

2. On a scale from 0% (not at all confident) to 100% (completely confident), how confident are you that you will be able to correctly detect if the person is feeling...

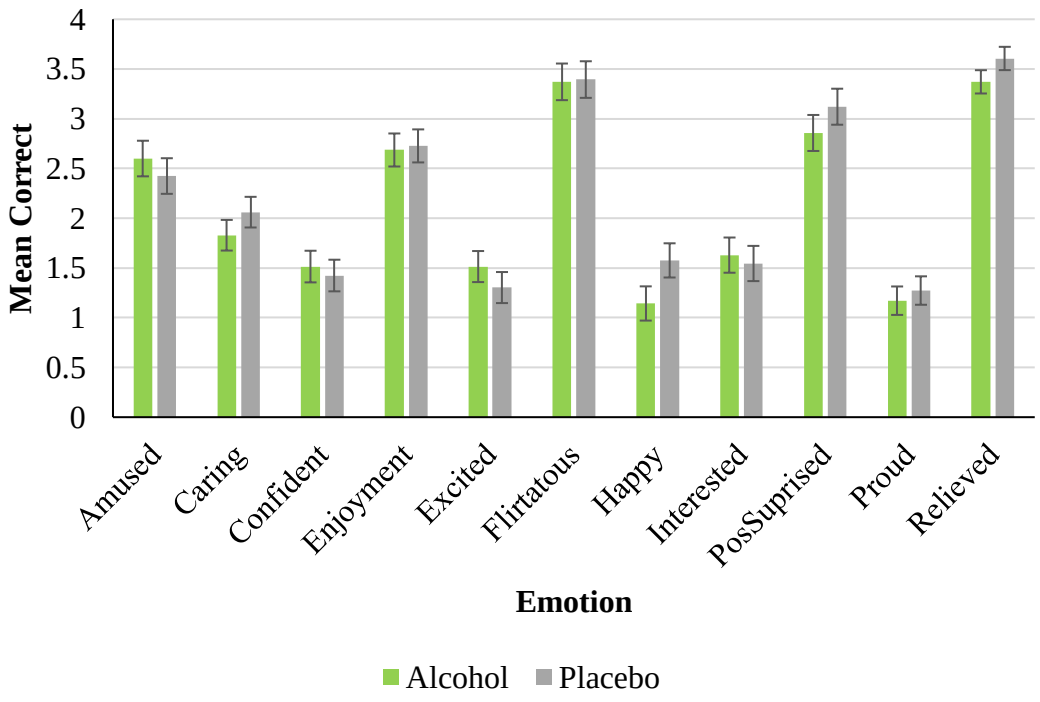
Negative emotions

a. annoyed? _____ %
b. disgusted? _____ %
c. shy? _____ %
d. fearful anxious? _____ %
e. Baffled/unsure? _____ %
f. Contempt? _____ %
g. Disinterested? _____ %
h. Suspicious? _____ %
i. Angry? _____ %
j. Negatively surprised? _____ %
k. Sad? _____ %

Positive emotions

l. Excited? _____ %
m. Positively surprised? _____ %
n. Interested? _____ %
o. Confident? _____ %
p. Flirtatious? _____ %
q. Happy? _____ %
r. Proud? _____ %
s. Caring? _____ %
t. Amused? _____ %
u. Enjoyment? _____ %
v. Relieved? _____ %

Appendix I: Means and standard errors for correct identification of eleven positive valenced emotions by group.



Appendix J: Means and standard errors for correct identification of eleven negative valenced emotions by group.